



Division of Drinking Water

# **Framework for Regulating Direct Potable Reuse (DPR)**

Information Item No.10  
State Water Board Meeting  
June 5, 2018

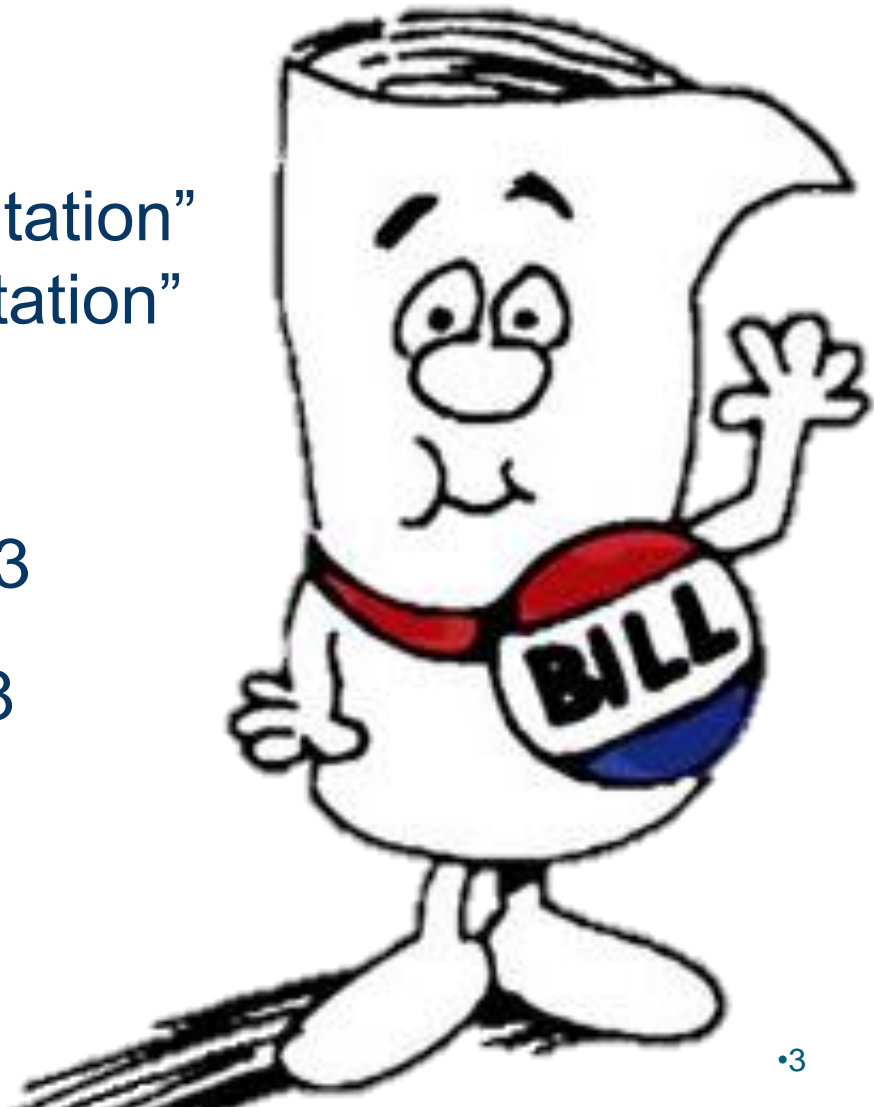
# DPR Framework

- DDW thinking on DPR
- Risk across the forms of DPR
- Research to fill knowledge gaps
- New SWA definition
- Stakeholder outreach
- Not a regulatory document

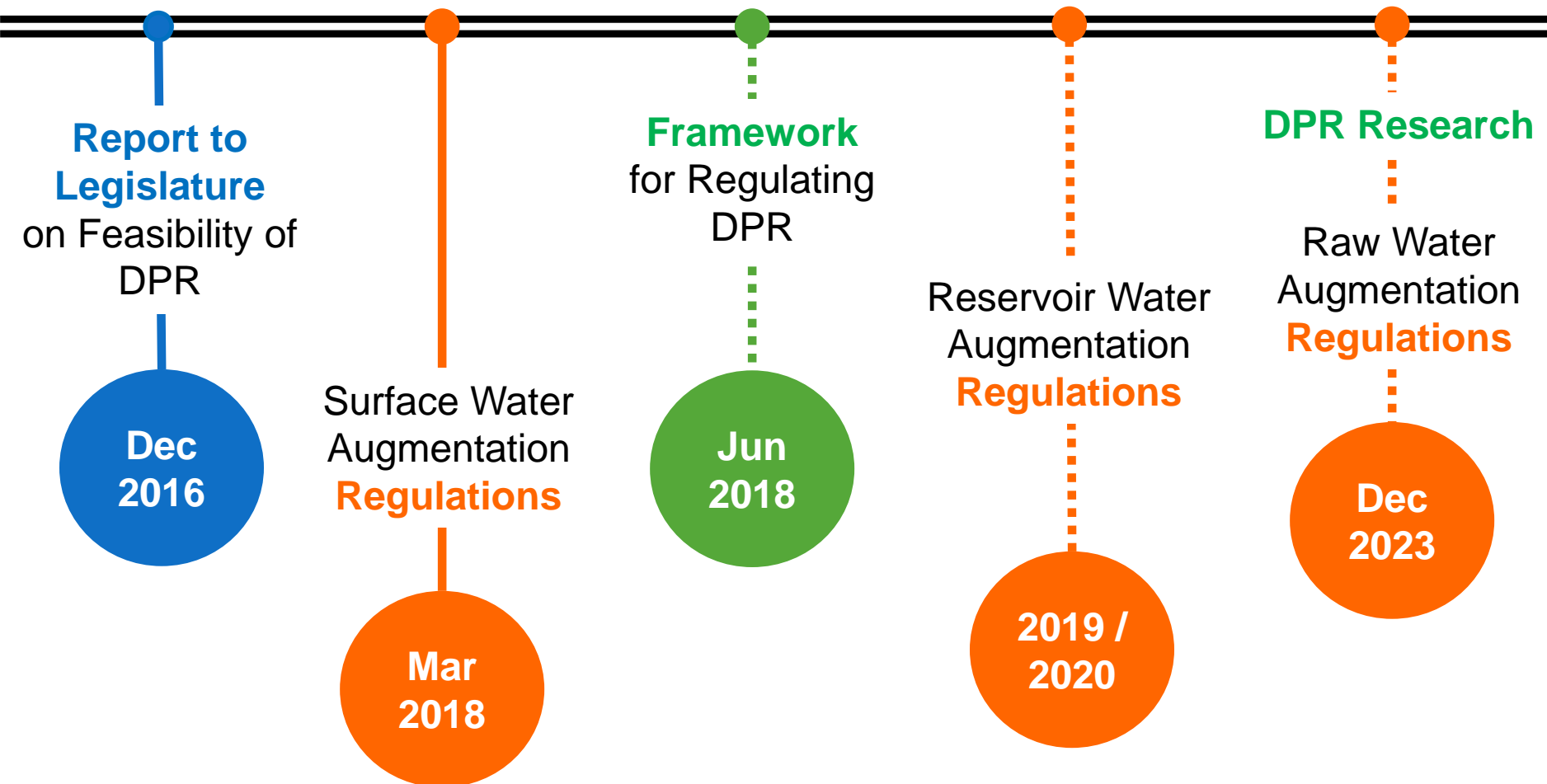


# Assembly Bill 574

- Defines “raw water augmentation” and “treated water augmentation”
- Changed SWA definitions
- RWA by December 31, 2023
- Framework by June 1, 2018



# Recent & Planned State Water Board Activities Related to Potable Reuse





**Safety  
First**



# Contents of the Framework

- Section 1: Introduction
- Section 2: Types of potable reuse
- Section 3: DPR scenarios
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- Section 9: Revising SWA regulations

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# Types of Potable Reuse



- Indirect potable reuse
  - Groundwater replenishment
  - Surface water augmentation  
(now => Reservoir Water Augmentation)



- Direct potable reuse
  - Raw water augmentation
  - Treated water augmentation

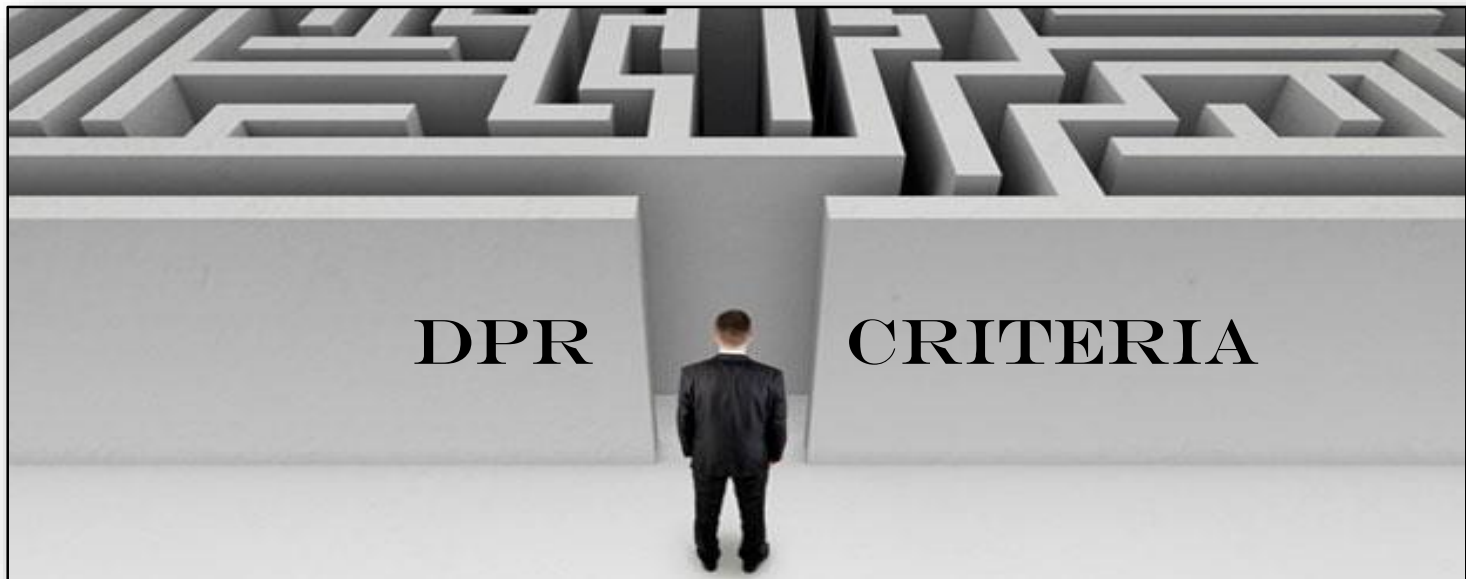


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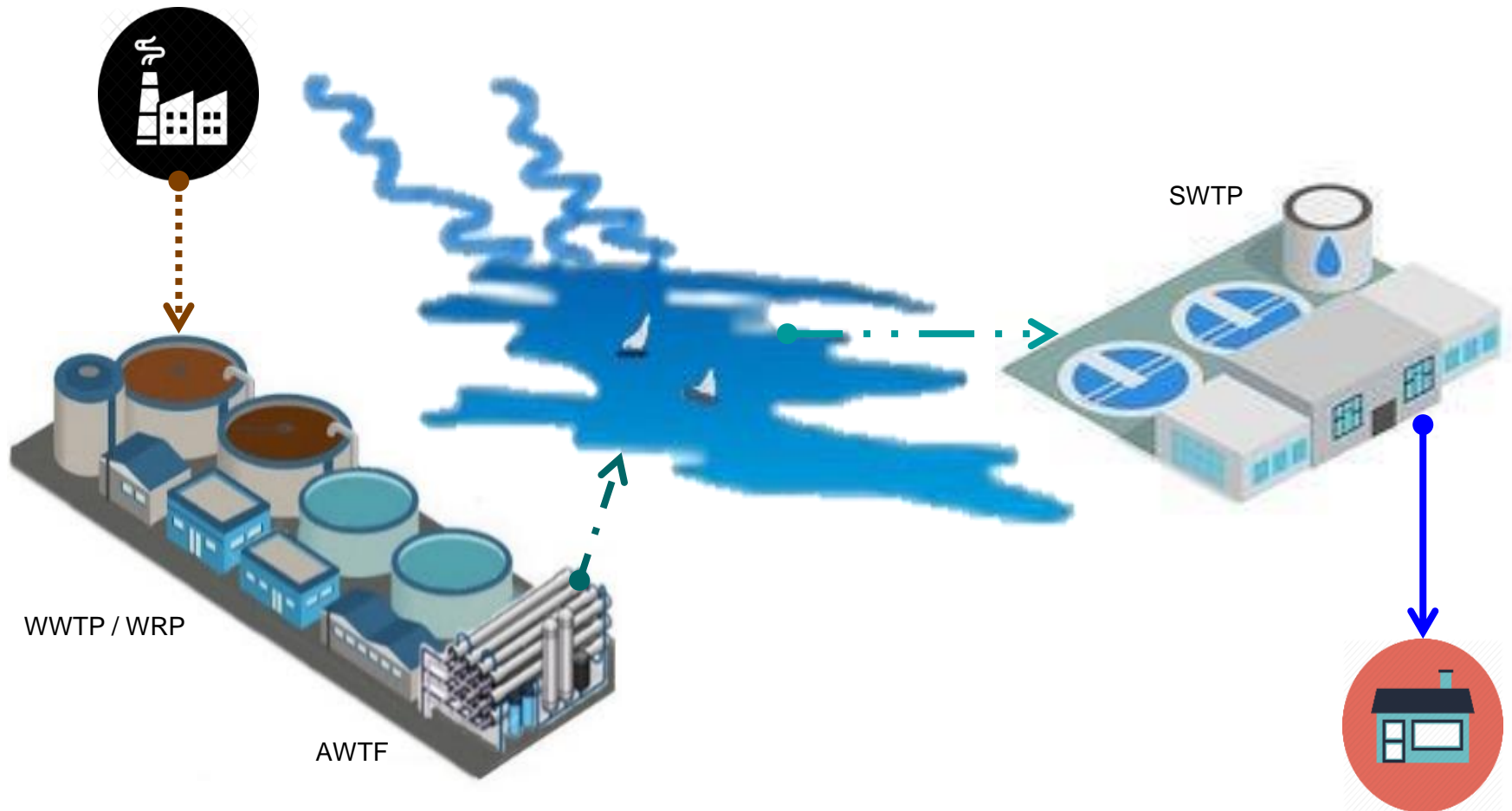
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# DPR Scenarios

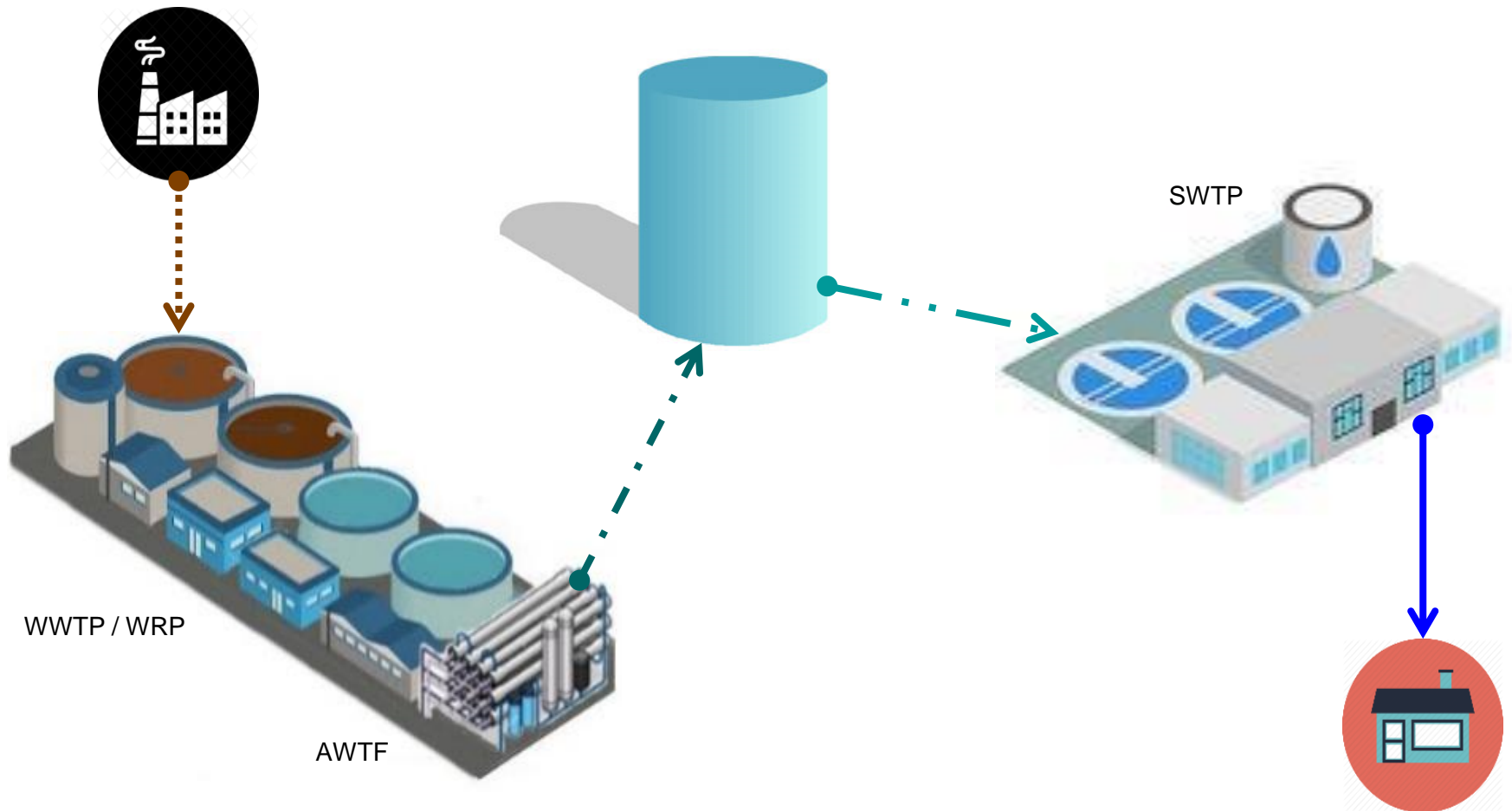
- Forms of DPR:
  - “Treated Water Augmentation”
  - “Raw Water Augmentation”
- Challenge – develop appropriate DPR criteria



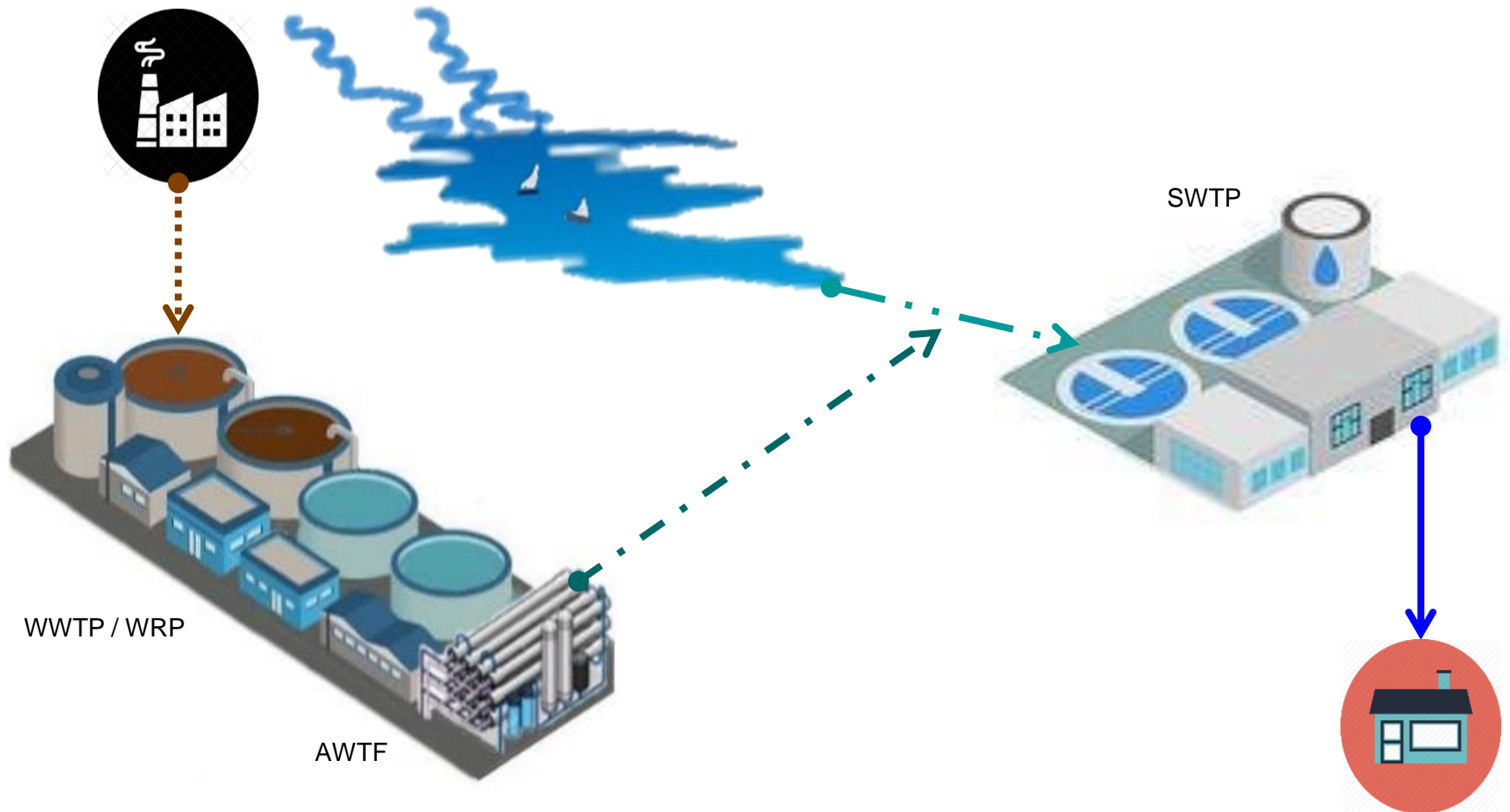
# DPR - Raw Water Augmentation



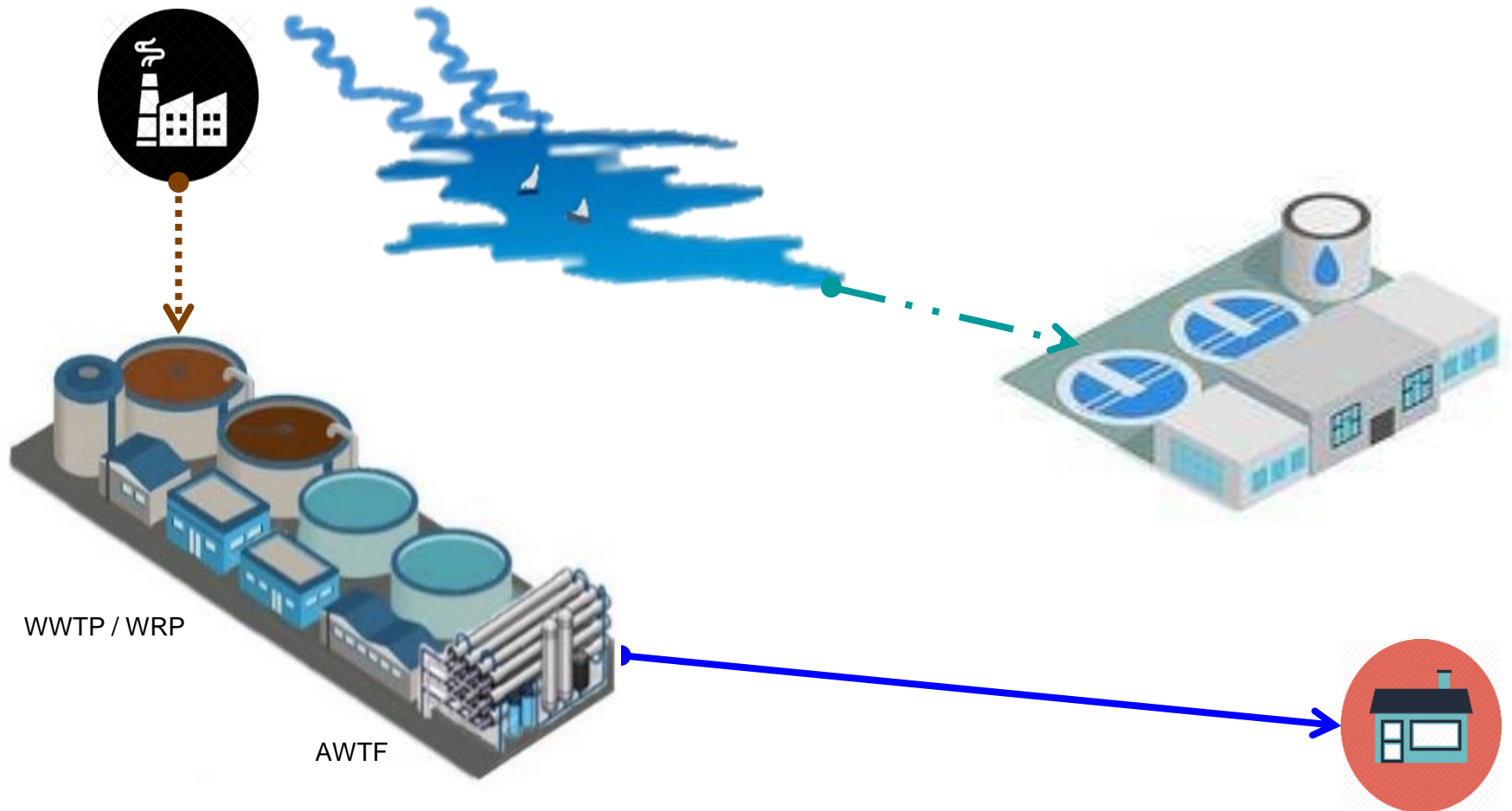
# DPR - Raw Water Augmentation



# DPR - Raw Water Augmentation



# DPR - Treated Water Augmentation





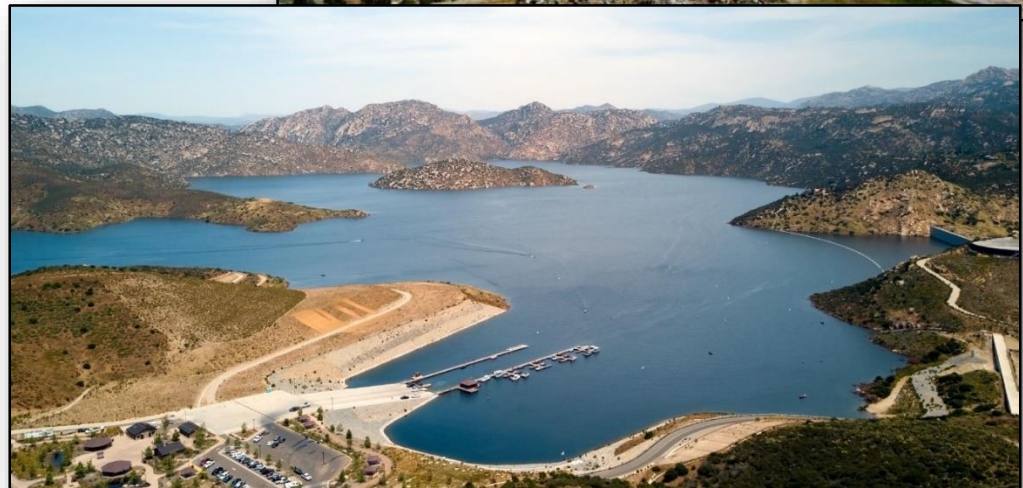
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# IPR - Environmental Buffer

- Reliable
- Provide benefits such as:
  - Attenuation of chemical peaks
  - Robust pathogen barrier
  - Response time



# Barrier Loss

- Lack of substantial environmental barrier.
- Ensure reliable, robust, redundant, resilient treatment and optimization control.



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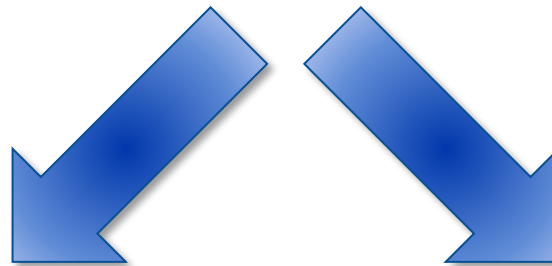


# HEALTH GOAL

Consistent level of safety as the  
type of DPR changes

# RISK MANAGEMENT

Compensate for the loss of a meaningful  
environmental buffer



**PATHOGEN CONTROL**

**CHEMICAL CONTROL**

# Pathogens – Removal Targets

- Reference pathogens
- Worst case wastewater pathogen density
  - Uniform statewide criteria
  - Case-by-case requires method & duration (peaks infrequent)
  - At what point is it OK for pathogens to leak through?
- LRV calculated from ratio of safe density to worst case wastewater density
- Quantitative microbial risk assessment (QMRA) used to verify LRVs meet risk goal
  - Annual or daily risk



# Cryptosporidium

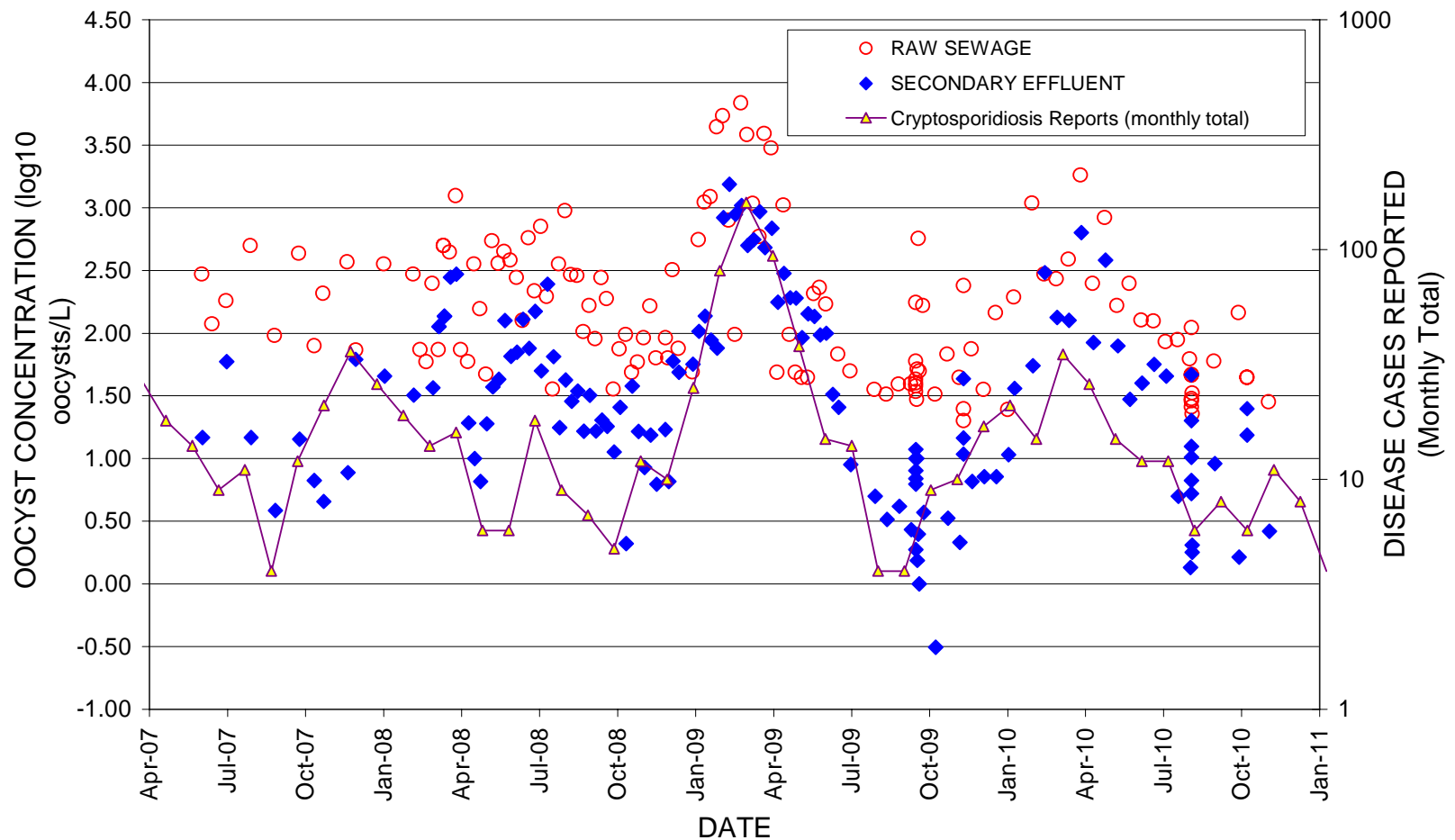
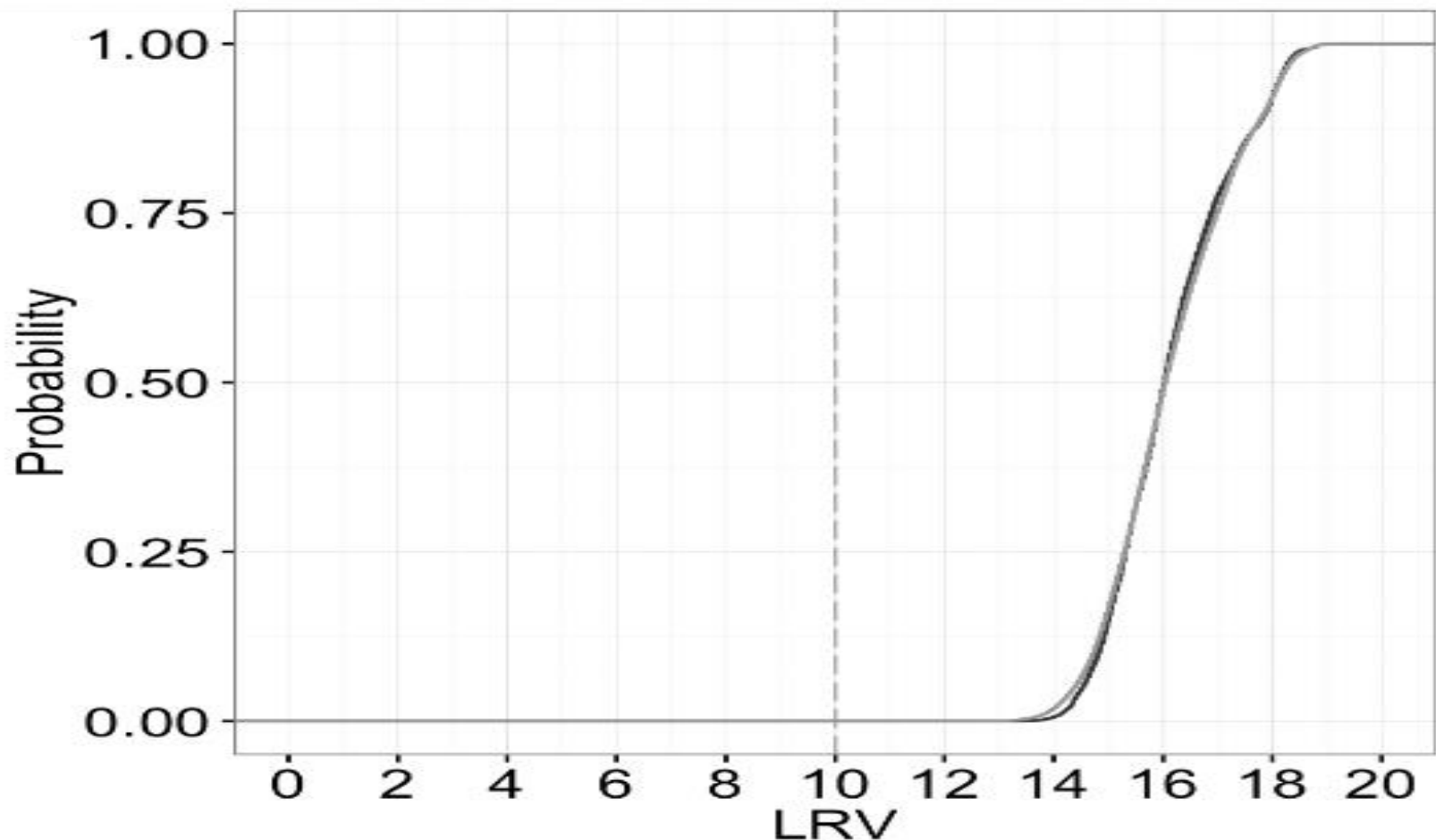


Figure 2 Raw sewage and secondary effluent *Cryptosporidium* concentrations compared reported cases of *Cryptosporidiosis*

# Pathogens - Treatment

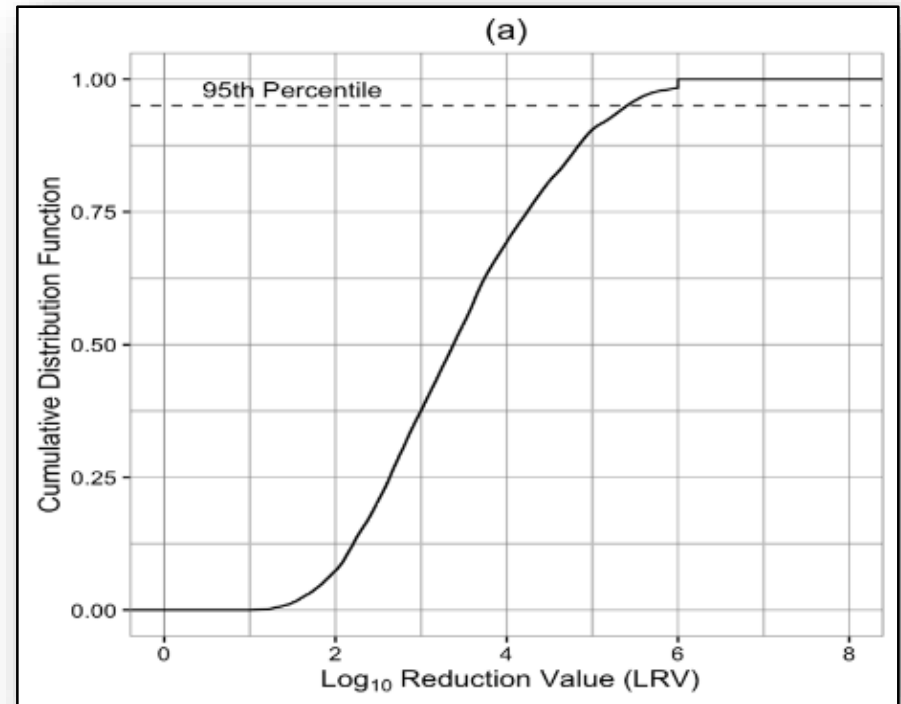
- Redundant treatment (extra log reduction capacity) may be required:
  - To compensate for the lack of an effective environmental buffer
  - A tolerable (very low) probability of failure to meet the LRV may be established
- Probabilistic analysis of treatment train performance (PATTP) will be used
  - Use Monte Carlo approach to create a cumulative distribution function for a set of treatment process – a treatment train

# Example PATTP - *Cryptosporidium*



# Pathogens - Treatment

- Validate processes and trains
  - Determine the LRV a treatment will achieve most of the time (5<sup>th</sup> percentile)
  - Correlate performance with a measurable parameter and identify limits indicating failure



# Pathogens - Treatment

- Monitoring and Control
  - Close proximity of wastewater pathogen densities to drinking water for DPR
  - The need for knowledge of water quality and the ability to take corrective action is urgent
  - Provide continuous monitoring of critical processes and fail-safe control
    - Fail-safe is not intended to mean failure proof
    - Fail-safe means the system will revert to a safe condition if a critical component fails

# Chemicals

The threat posed by chemicals in DPR is similar to that for IPR in that advanced treatment must be provided to control the potential chronic exposure hazard from a wide variety of unregulated chemicals.

The threat posed by chemicals in DPR is different for IPR in two important ways:

- Without an environmental buffer pulses of low molecular weight chemicals may pose an acute threat
- Without an environmental buffer the urgency of recognizing and responding to treatment deficiencies increases

# Chemicals

- The goal:
  - remove chemicals to levels that are below public health concern
- The approach:
  - Enhanced source control and public education
  - Conformance with MCL and Notification Level (NL) requirements
    - Development of additional NLs as appropriate
  - Required advanced treatment
  - Something to deal with pulses of low molecular weight chemicals
  - Rigorous monitoring and treatment control



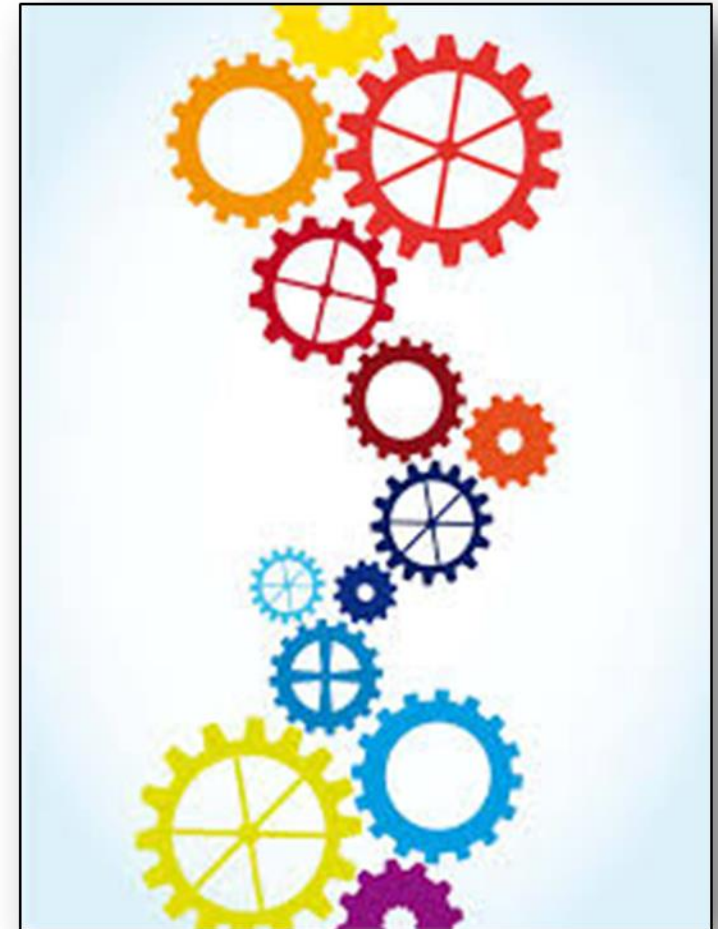


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# DPR Criteria Elements

- DPR Permitting Authority
- Addressing Pathogens
- Chemical Control
- Source Control
- Critical Control Point Approach
- Cross Connection



# DPR Permitting Authority

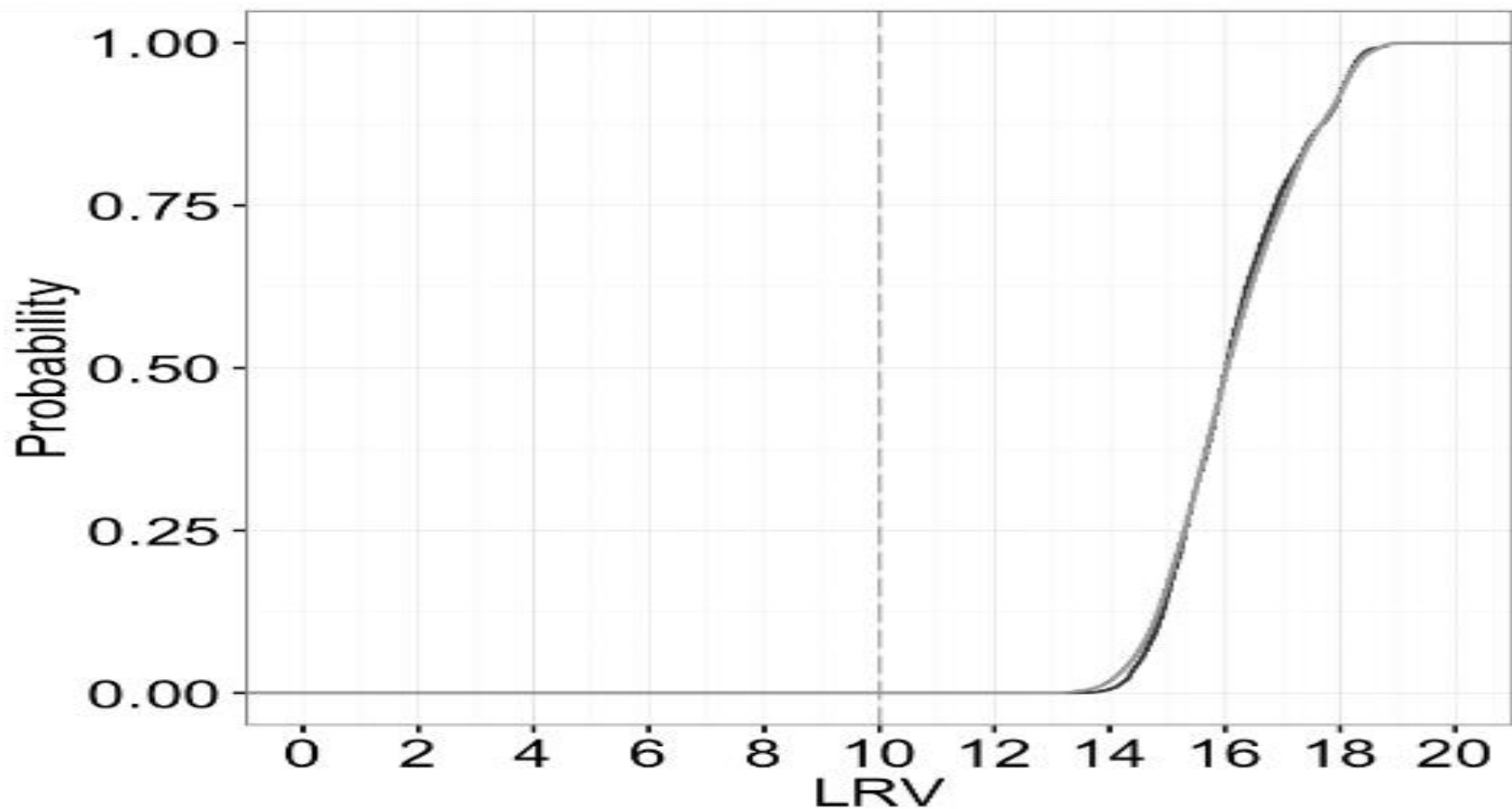
- Facilities co-located or separate
- Various ownership scenarios
- Regional Board regulatory approvals
- Regional Board authority
- Dual permits
  - Safe Drinking Water Act
  - Clean Water Act
  - Porter-Cologne WQC Act



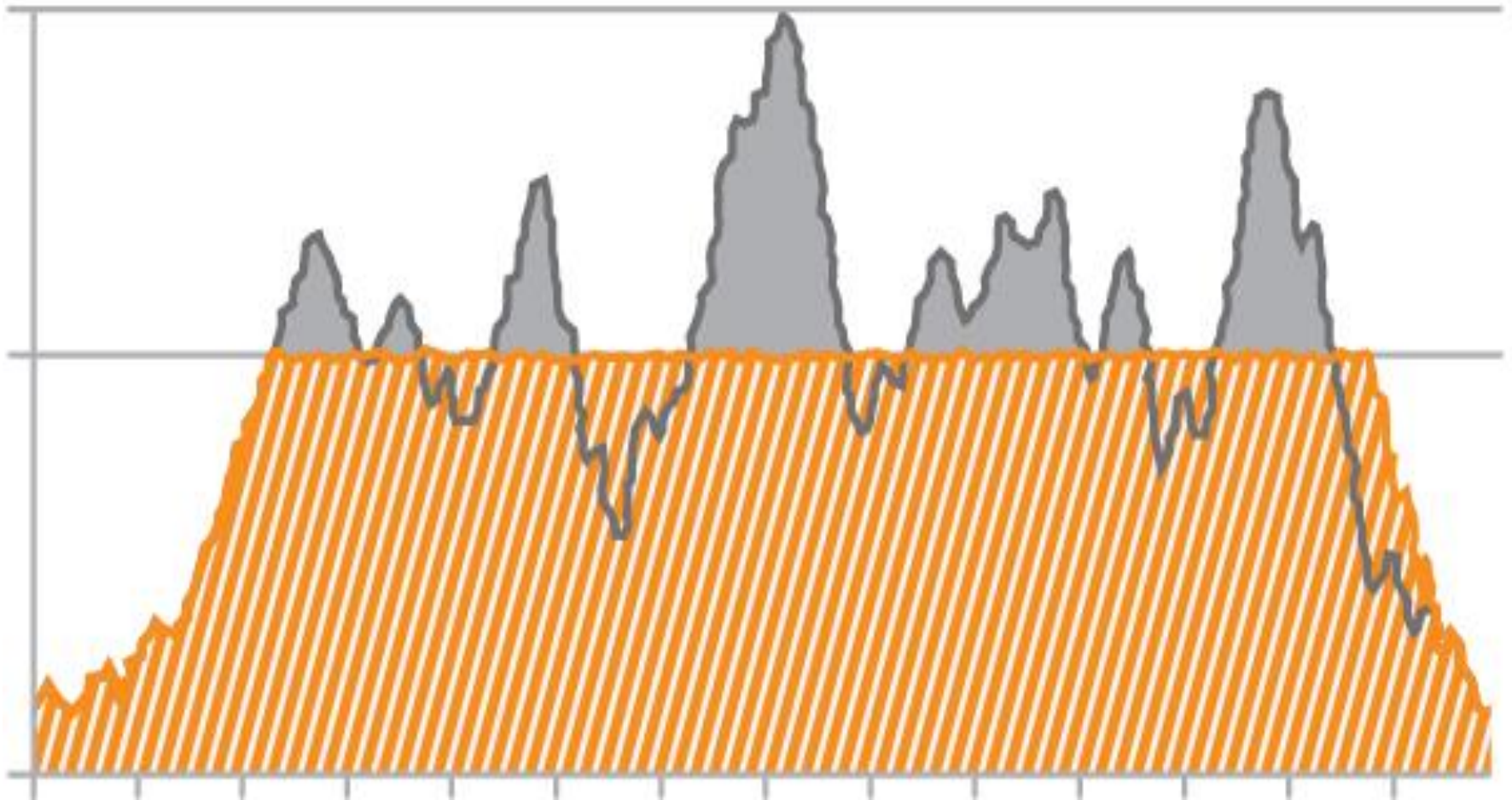
# Addressing Pathogens

- Identify LRVs
- Set LRV compliance criteria
  - Treatment train minimum LRV (using QMRA)
  - Multi-barrier requirements
  - Tolerable excursions (using QMRA)
- Treatment validation criteria
- Treatment train evaluation with PATTP
- Perhaps preapproved treatment train(s)
- Operations plan to assure treatment efficacy

# Example PATTP - *Cryptosporidium*



# Chemical Control

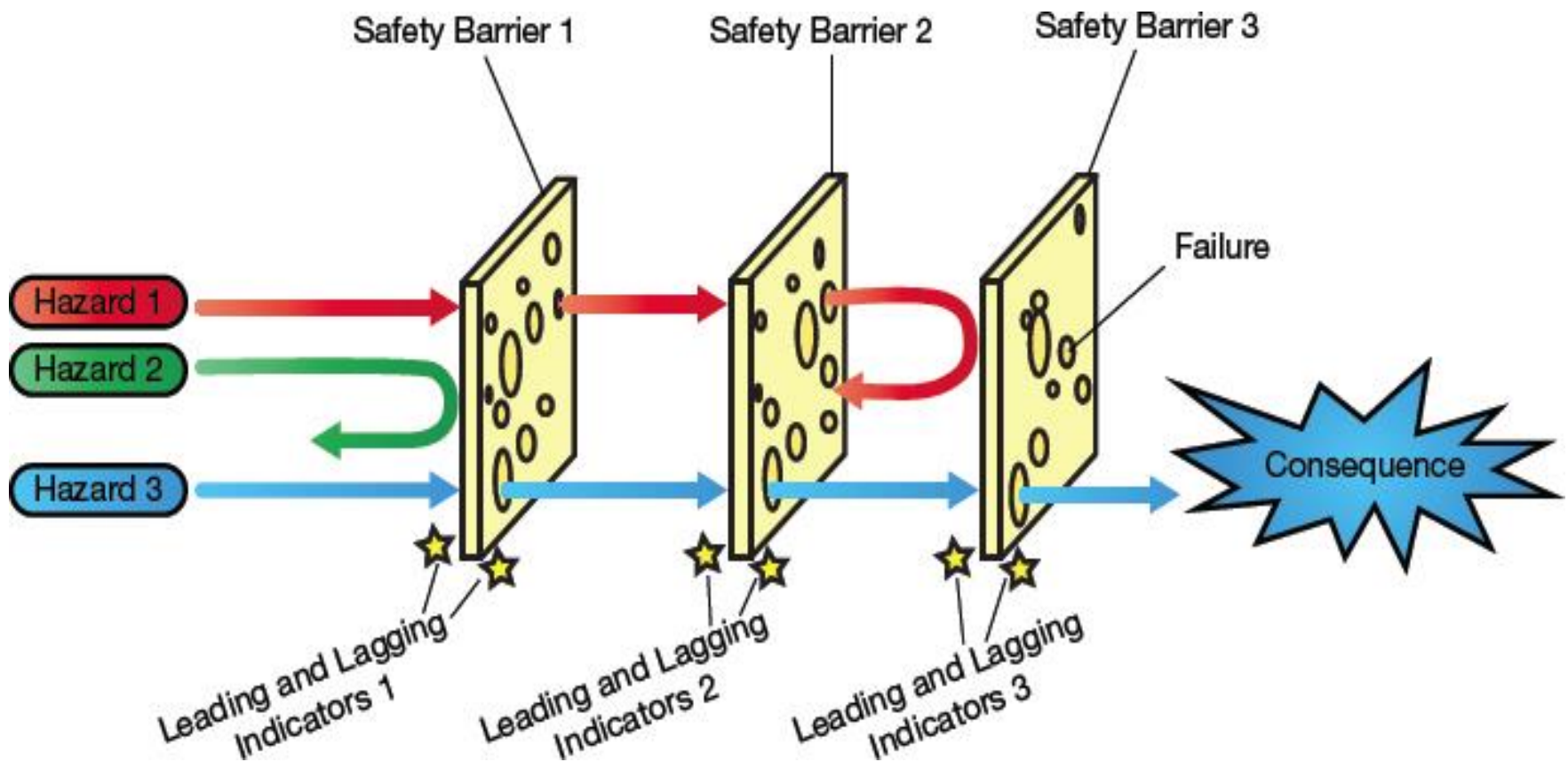


# Source Control





# Critical Control Point Approach



# Cross-Connection

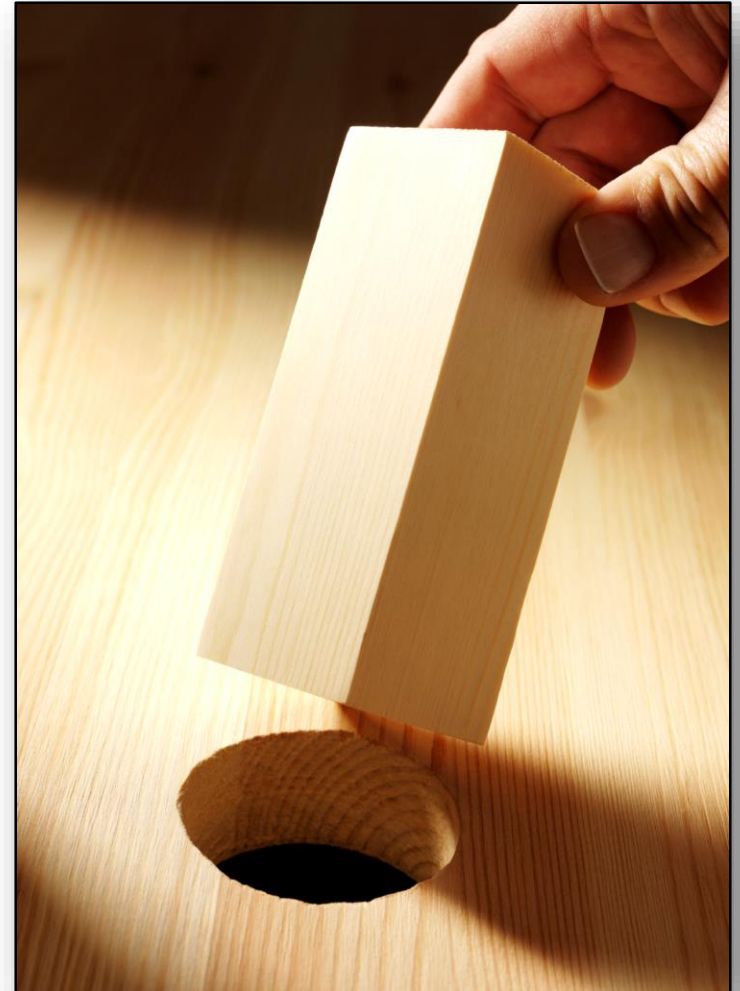


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# Other Considerations

- Potable reuse inspection and supervision program
- Treatment system resilience
- Operations quality control
- Public health protection culture
- Public health surveillance



# Inspection and Audits





# Treatment System Resilience



# Operators





# Public Health Minded



# Public Health Surveillance



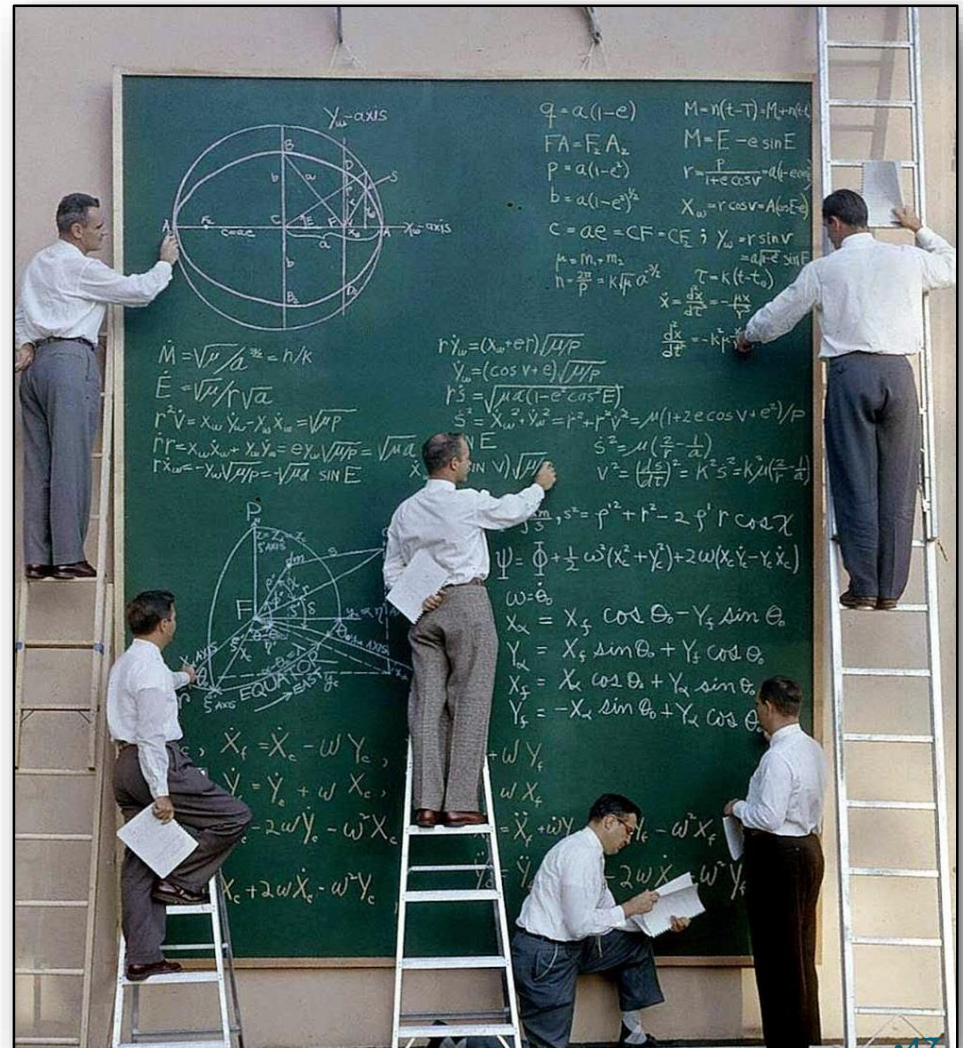
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# DPR Research

- QMRA
- Raw wastewater monitoring
- Outbreak data collection
- Averaging
- Unknown-CEC methods

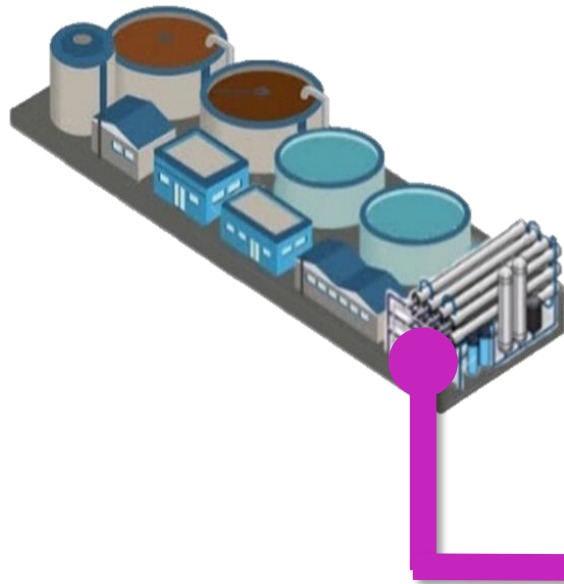


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# New SWA Definition











For today's presentation, Framework, comment & contact info, visit  
**SWRCB DDW Direct Potable Reuse webpage**

[https://www.waterboards.ca.gov/drinking\\_water/certlic/drinkingwater/direct\\_potable\\_reuse.html](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/direct_potable_reuse.html)

For future updates, visit and subscribe to  
**SWRCB electronic mailing list**

[http://www.waterboards.ca.gov/resources/email\\_subscriptions/swrcb\\_subscribe.shtml](http://www.waterboards.ca.gov/resources/email_subscriptions/swrcb_subscribe.shtml)

Drinking Water → “Recycled Surface Water Augmentation & Direct Potable Reuse”

For more information on 2016 Report to Legislature, visit  
**DDW Report to the Legislature webpage**

[http://www.waterboards.ca.gov/drinking\\_water/certlic/drinkingwater/rw\\_dpr\\_criteria.shtml](http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/rw_dpr_criteria.shtml)

# Contact Us

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## Submit comments on the Framework

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By mail	Sherly Rosilela, P.E. Division of Drinking Water, Recycled Water Unit State Water Resources Control Board P.O. Box 100 Sacramento, CA 95812-100



Questions

